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AUTHOR Parsons, Jim
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ABSTRACT

A social studies educator responds to a paper by Glen Aikenhead titled "Science in Social Studies." To remind science people that social issues are ultimately human as opposed to ultimately scientific, the author begins the paper with a discussion about the ways humans come to gain knowledge through science, religion, philosophy, and art. If science education is to deal correctly with social issues, it must deal with the full range of how humans come to resolve these issues. The author then addresses four issues raised by Aikenhead. First he disagrees with Aikenhead's portrayal of science as formal and his statement that the mission of science educators is to produce professional scientists. For a student to use science as a tool to help resolve social issues, science must become more available to the student. Courses must not be just for the training of professional scientists. Secondly, the author disagrees with Aikenhead's portrayal of decision making--i.e., that decision making in society is done mostly by those in key power positions. Every person is a decision maker, including scientists and regular citizens. The third issue addressed is Aikenhead's statement that because the human environment is changing, humans are changing. Many social studies people disagree with this view. Science and society change, but the fundamental social issues remain essentially the same. The fourth issue addressed is the idea of the resolution of social issues. Scientific knowledge alone is not sufficient for solving social problems. Knowledge from several sources must be utilized. (Author/RM)

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SOCIAL STUDIES LOOKS AT SCIENCE: A CRITICAL REVIEW OF "SCIENCE IN SOCIAL ISSUES"

Jim Parsons, Associate Professor
Department of Secondary Education
University of Alberta, Edmonton, Alberta

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Jim Parsons, Associate Professor
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MAR 15 1982

I'm pleased to be able to respond to Glen Aikenhead's Discussion Paper titled "Science in Social Issues" from the viewpoint of a person who lives his life in social studies. First, I must commend this paper and its movement towards a synthesis of science and social issues. Certainly, in my opinion, the paper is a cut above the first discussion paper from the Science Council of Canada, "A Canadian Context for Science Education," which seemed to me extremely uncritical of how science is viewed by others. Glen Aikenhead, to his credit, is critical.

To a social studies person, "Science in Social Issues" offers much opportunity for discussion about issues important to both science, as an enterprise, and about how humans live in a social context. I mean in my response to the paper to speak to four issues that seem to me particularly important. These are:

(1) The idea of science as a formal, specialized task.

(2) The idea of the efficacious citizen.

(3) The idea of human dilemma and social change.

(4) The idea of the resolution of social issues.

To a social studies person, science is an important source of knowledge for humans. That is, science is one of the main activities that humans employ to gain knowledge about the world. In his discussion paper, Glen suggests that science is that activity that humans use to satisfy their curiosity about the

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world. Let me add to that definition. Science is the activity that humans use to satisfy their curiosity about the world through experimentation and observation. What this suggests is that scientists gain knowledge through a particular, general methodology -- they try something and they watch what happens. While knowledge gained through experimentation and observation is important, when dealing with social issues it is not the only kind of important knowledge.

P.D. Ouspensky, a Russian philosopher, states that their are four ways that humans gain knowledge. Science, knowledge gained through experimentation and observation, is one way. A second way of knowledge is religious knowledge -- knowledge gained through revelation. I recall, in 1975, writing a ficticious dilemma about a medical missionary in a Third World Country who has come to question his mission. He has healed many people, but this act has seemed to cause greater hardship since the people he has healed have produced many offspring who are now consuming greater amounts of food. As a result, the missionary questions whether he has caused more hardship than he has alleviated. What should he do? I thought the dilemma I had written was both useful for student discussion and quite cleverly written, it was not an easy dilemma. A week or so later, as I was walking in Austin, Texas, I walked past a young lady whom I would guess was anorexigenic. I remember how she looked vividly -- thin -- tall. Suddenly, the dilemma I had written had more meaning than ever before. Her appearance revealed knowledge to me.

Ouspensky also states that people come to know through philosophy. Philosophic knowledge is gained through human speculation. All humans build theories about the structure of life and the world. For example, in Glen's paper there are,

at least, two clear philosophical theories put forth. On page 13, Glen speculates about the nature of science, separating science into three ideas through his three questions. Question 1 infers that to understand science one must understand it as a type of work. Question 2 infers that to understand science one must understand it as a way of knowing. Question 3 infers that to understand science one must understand it as a tool to help solve social problems. I have no quarrel here, and only mean to make the point that this is philosophy as opposed to science. Glen's second important philosophical speculation is (page 26) that people "for sake of discussion" can be broken into three groups (1) professional scientists, (2) key decision makers, and (3) citizens. (Here, I have a quarrel with Glen about the implications of his philosophy and these will be discussed later). Glen has speculated about the order of the world and has categorized three types of people. He has done philosophy.

The fourth kind of human knowledge is artistic knowledge. Artistic knowledge is emotive (emotions) knowledge. We can either come to know ourselves through our own creative self-expressions or come to know other persons, groups, or times through art. For example, I have used Charles Dickens' novel Hard Times in my university classes to show Dickens' perception of an education based on "the facts, the facts, the facts." Through Gradgrind's experiences and the dilemma of Gradgrind's son Tom, the reader can come to see how Dickens views a certain kind of pedagogy and, maybe, gain insight into his own view.

The point of this philosophical (by my own definition) discussion about the ways humans come to gain knowledge is to remind science people that social issues are ultimately human as opposed to ultimately scientific. If a science education is to deal correctly with social issues, it must deal with the full range o

how humans come to resolve these issues. Can science teachers tolerate discussions in their classrooms where students state that they, personally, had settled the issue to their satisfaction because they had a "religious experience" or because they read a poem about a "jar in Tennessee?" If they are to deal with social issues, they must. Scientific knowledge, alone, is not sufficient for the resolution of social issues. Just as Glen can not stay away from philosophy in his paper, people resolving social issues can not stay away from religion, art, and philosophy. Man can not live by science alone. What a change this will bring to many science classrooms. Are teachers ready and willing?

SCIENCE AS FORMAL

I disagree with both Glen's portrayal of science as formal and, to me, science educators' mission to produce professional scientists. God bless scientists. I have nothing inherently evil to say about them. And, for them science is a formal, specialized activity, just as golf is a formal, specialized activity to those who earn their living at it. However, many hackers like me enjoy golf at a different level. There are many scientific "hackers" as well. Glen suggests (page 53) that science is an abstraction. Why? Certainly it can be; but, it certainly need not be. If science is a way of satisfying curiosity through experimentation and observation, help us know how to do science better. Science can be for everyman. I would like science teachers to teach biology rather than biologists, zoology rather than zoologists, physics and chemistry rather than physicists and chemists. Those science teachers whom I enjoyed were not the ones who wanted to show me how relevant science was to my life but rather the ones who showed me how much science was already a part of my life. For a student to use science as a tool to help resolve social issues, science must become more

available to the student. Courses must not just be for the training of professional scientists.

THE EFFICACIOUS CITIZEN

Undoubtedly, my biggest disagreement with Glen's work is his portrayal of decision making - how it's done and who does it. Throughout the discussion paper, a common theme is that decision making in society is done mostly by those in key (power) positions. For example, on page 15 Glen states that science has not prepared students for the future responsibilities or the role they will play. On page 29, Glen discusses citizens who become decision makers. The focus within the paper is on people who, in the future at some point, will make decisions. To most social studies people, their students are already decision makers making personally crucial decisions about social issues. These students, obviously, do not have the global perspective or the well-developed ability to gather evidence that more mature humans have. But they do make decisions about the conflict between their own freedom vs the control placed on them by others, they are often caught in the middle of families trying to cling to tradition in an atmosphere of change, and they are constantly making ethical decisions that contrast what they believe is right with what they can explain. These categories or issues are no different than the issues that adults face.

Let me add another touch of philosophy. I would synthesize social issues into three: (1) Freedom vs Control, (2) Tradition vs. Change (3) Ethics vs Rationality. I must credit Etzionni's book The Active Society with these categories, since they struck me during my reading of the book. I have been testing these categories against dilemmas or issues for about two years (science) and they seem to work. Interestingly, I have since tried to find the source in Etzionni's

work but have been unsuccessful. I had a student also read through the book to spot the source, she couldn't. So, while I must credit Etzionni I can't do so exactly. Obviously, this was revelation.

The breakdown of social roles on page 26 is particularly interesting and revealing. I see three points expressed here. These are:

(1) Canadian society is structured so that key decisions are made by a few powerful specialists in decision making,

(2) Scientists do not make very important decisions, and

(3) The general citizenry are quite unsuccessful at understanding and are subject to other, more powerful, people.

Let me attend to each to these, briefly. First, the idea that Canada is run by a powerful elite who make key decisions is an idea voiced and implied through the discussion paper. That Canada is democratic is a philosophical theory based upon our founding fathers' speculations about forms of governments. That Canada is a country where key decisions are made by powerful experts is a philosophical theory based upon Glen's speculations on how "things really are." One is no more "true" than the other until citizens come to act on their different speculations. The 1981 Alberta Social Studies Curriculum teaches that citizens of Alberta can, and should, be powerful forces towards the resolution of social issues. Canada has a representative government and important decisions are made by persons granted that responsibility. Canada also has responsible government in which all citizens can participate. This paper would suggest that science educators, when dealing with social issues, would teach differently.

Second, Glen's indication seems to be that scientists make different kinds of decisions than other people. For example, on page 28 Glen suggests methods used in making a scientific decision. These include (a) reaching concensus on an observation, (b) picking a working hypothesis, and, in general, (c) what to do next in any scientific experiment. (Page 60 echoes the same decisions). Also, on page 28, Glen states that "Potential decision makers are less easily identified than are future scientists" and the "Key decision makers carry out a prominent function in determining the quality of Canadian society." The separation of scientists from decision makers is quite frankly, to me, frightening.

On page 29, the importance of a judicial decision on whether or not to grant patents on organisms produced by cell fusion is mentioned. Is it assumed that scientists will produce these organisms without thought? On page 42, Glen states that the dropping of the atomic bomb on Hiroshima was a political decision. Certainly it was. But, it was a political decision made possible by a small group of scientists who refused to make an ethical decision not to produce the bomb in the first place. What about recombinant DNA? The separation of scientists and decision makers is improper from a social studies point of view since it allows the scientist too much opportunity to play Pontius Pilate with ethics.

Third, Glen seems to portray the general citizenry as somehow unable to act powerfully. Citizens are people "who try to make sense," "who try to cope," and "who are called upon" (by others) to voice opinions. It may simply be a reaction to terminology, but I get the feeling that citizens are viewed an unable to act on their own behalf. This view is certainly not popular with most social studies people and, if promoted in a science and social issues curriculum suggests how social issues are not to be resolved.

HUMAN DILEMMA AND SOCIAL CHANGE

Briefly, because this point is not major to the paper and because it has been touched earlier, there is a tendency to believe that because human environment is changing (rapid growth of technology) humans are changing. Many social studies people disagree with this view. That the world is changing is not to be disputed. "Future Shock" (and other tradition vs change dilemmas) does affect people. But, the change in environment and circumstances does not, necessarily, change fundamental social issues. In fact, an important reason to study history is that history shows examples of other people involved in the resolution of social issues. (For example, Martin Luther's tension with the Catholic Church can be seen as similar to Louis Riel's tension with Canada as similar to Ralph Nader's tension with the auto industry). My belief is that science and society change, but the fundamental social issues remain essentially the same. People are not faced with new ethical questions. They are, rather, faced with new circumstances in which to resolve these questions. Adolescents are not "outsiders" trying to make sense out of a society shaped by science and technology (page 22). They are human "insiders" grappling with fundamental social issues, at their own level. Science, as a human enterprise, can help them grapple.

THE RESOLUTION OF SOCIAL ISSUES

Using this discussion paper as evidence, were science a religion there would be two prinary dogmas. First, there would be the dogma of seeking knowledge through the general methodology of experimentation and observation. Second, there would be the dogma of tentativeness (page 61). Scientific knowledge is tentative knowledge. The reporting of scientific knowledge is the reporting of

redundant experience. But, as Glen quite correctly suggests, the knowledge gained from science is dependant, partly, on the technology available. For example, scientists use the microscope to see smaller phenomena more clearly and the telescope to see distant phenomena more clearly. As new tools are perfected for better viewing, redundant experience is replaced with new experience. There is good reason for scientific knowledge to be tentative. But, can this tentativeness be carried over into the resolution of social issues?

Glen's paper talks a great deal about the nature of science but not a great deal about the nature of students. If the classroom scenario described on page 38 is typical of the resolution of social issues in a science classroom, my opinion is that students would not be satisfied. There is a great deal of analysis towards the resolution of the issue, but no actual resolution of the issue. The activity comes up short. While this tentativeness might be good science, I would suspect that students would find it frustrating.

CONCLUSION

James Page's discussion paper "A Canadian Context for Science Education" laments the demise of science and the lack of money and programs. There is no doubt that science has fallen from the status of a God-term (Richard Hoffsteader, Anti-Intellectualism in American History). In my mind, the real demise of science can be seen more in the fact that science is no longer used to sell commercial products through the media than in program and budget cuts, these being tied to the personal political whim of "key decision makers." We used to see toothpaste, hair tonic, and gasoline sold by calling attention to scientific formulas. Progress used to be General Electric's most important product. Things have changed.

Today we are more apt to see "natural" or "organic" cosmetics or foods. A large percentage of people view science more as problem than as solution.

Probably, it is equally unfair to view science as a saviour or as a curse. Science is, quite simple, one way that humans gain knowledge. As a source of knowledge, it is useful for the resolution of social issues. In order to gain the greatest use from the synthesis of science curricula with social issues, I believe the following points should be noted by science educators.

(1) Every person does science, it does not have to be a formal activity. The purpose of science education should not, necessarily, be the education of professional scientists.

(2) Every person is a decision maker, including scientists and "regular" citizens.

(3) Although science, technology, society, and human circumstance change, the fundamental social issues faced by people do not change.

(4) Knowledge useful for the resolution of social issues comes from several sources. Scientific knowledge alone is not sufficient for the resolution of social issues.

The juxtaposition of science education and social issues is an important connection. However, without a clear understanding of social context science educators may find that their curriculun lacks an essential understanding.